Notice of Allowability	Application No. 10/017,574	Applicant(s) WALSTER ET AL.	
	Examiner Chat C. Do	Art Unit 2193	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *01/18/2005*.

2. ☒ The allowed claim(s) is/are *1-8,10-18,20-28 and 30*.

3. ☒ The drawings filed on *13 December 2001* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date *herein* .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

TODD INGBERG
PRIMARY EXAMINER

EXAMINER'S AMENDMENT

1. Claims 1-8, 10-18, 20-28, and 30 are allowed.

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Edward J. Grundler on 04/26/2005.

The application has been amended as follows:

In specification page 10 lines 5-13, the applicant authorized to delete lines 10-13 in order to clearly define the computer readable storage medium as a tangible medium.

The data structures and code described in this detailed description are typically stored on a computer readable storage medium, which may be any device or medium that can store code and/ar data for use by a computer system. This includes, but is not limited to, magnetic and optical storage devices such as disk drives, magnetic tape, CDs (compact discs) and DVDS (digital versatile discs or digital video discs)~~, and computer instruction signals embodied in a transmission medium (with or without a carrier wave upon which the signals are modulated). For example, the transmission medium may include a communications network, such as the Internet~~.

For claims 1, 11, and 21, the applicant authorized to amend the words "can be" as "is" to avoid indefinite language in the claims.

Re claim 1, A method for using a computer system to solve a global inequality constrained optimization problem specified by a function f and a set of inequality constraints $p_j(x) =< 0$ (i=1, ...,m), wherein f and p_i are scalar functions of a vector $x = (x_1, x_2, x_3, ... x_n)$, the method comprising: receiving a representation of the function/and the set of inequality constraints at the computer system; storing the representation in a memory within the computer system, performing an interval inequality constrained global optimization process to compute guaranteed bounds on a globally minimum value of the function f(x) subject to the set of inequality constraints; wherein performing the interval global optimization process involves, applying term consistency to the set of inequality constraints over a sub-box X, and excluding any portion of the sub-box X that is proved to be in violation of at least one member of the set of inequality constraints; and recording the guaranteed bounds in the computer system memory; wherein applying term consistency involves: symbolically manipulating an equation within the computer system to solve for a term, $g(x'_j)$, thereby producing a modified equation $g(x'_j) = h(x)$, wherein the term $g(x'_j)$ ~~can be~~ is analytically inverted to produce an inverse function $g^{-1}(y)$; substituting the sub-box X into the modified equation to produce the equation $g(X'_j) = h(X)$; solving for X'_j with the j-th element of the sub-box X to produce a new sub-box X^+; wherein the nuew sub-box X^+ contains all solutions of the equation within the sub-box X,

and wherein the size of the new sub-box X^+ is less than or equal to the size of the sub-box X.

Re claim 11, A computer-readable storage medium storing instructions that when executed by a computer cause the computer to perform a method for using a computer system to solve a global inequality constrained optimization problem specified by a function f and a set of inequality constraints $p_j(x) =< 0$ (i=1, ...,m), wherein f and p_i are scalar functions of a vector $x = (x_1, x_2, x_3, ... x_n)$, the method comprising: receiving a representation of the function/and the set of inequality constraints at the computer system; storing the representation in a memory within the computer system, performing an interval inequality constrained global optimization process to compute guaranteed bounds on a globally minimum value of the function f(x) subject to the set of inequality constraints; wherein performing the interval global optimization process involves, applying term consistency to the set of inequality constraints over a sub-box X, and excluding any portion of the sub-box X that is proved to be in violation of at least one member of the set of inequality constraints; and recording the guaranteed bounds in the computer system memory; wherein applying term consistency involves: symbolically manipulating an equation within the computer system to solve for a term, $g(x'_j)$, thereby producing a modified equation $g(x'_j) = h(x)$, wherein the term $g(x'_j)$ ~~can be~~ is analytically inverted to produce an inverse function $g^{-1}(y)$; substituting the sub-box X into the modified equation to produce the equation $g(X'_j) = h(X)$; solving for X'_j with the j-th element of the sub-box X to produce a new sub-box X^+; wherein the nuew sub-box X^+

contains all solutions of the equation within the sub-box X, and wherein the size of the new sub-box X^+ is less than or equal to the size of the sub-box X.

Re claim 21, An apparatus for using a computer system to solve a global inequality constrained optimization problem specified by a function f and a set of inequality constraints $p_j(x) =< 0$ (i=1, ...,m), wherein f and p_i are scalar functions of a vector $x = (x_1, x_2, x_3, ... x_n)$, the apparatus comprising: a receiving mechanism that is configured to receive a representation of the function/and the set of inequality constraints at the computer system; a memory within the computer system for storing the representation', a global optimizer that is configured to perform an interval inequality constrained global optimization process to compute guaranteed bounds on a globally minimum value of the function f(x) subject to the set of inequality constraints, a term consistency mechanism within the global optimizer that is configured to, apply term consistency to the set of inequality constraints over a sub-box X, and to excluding any portion of the sub-box X that is proved to be in violation of at least one member of the set of inequality constraints; and a recording mechanism that is configured record the guaranteed bounds in the computer system memory; wherein applying term consistency involves: symbolically manipulating an equation within the computer system to solve for a term, $g(x'_j)$, thereby producing a modified equation $g(x'_j) = h(x)$, wherein the term $g(x'_j)$ ~~can be~~ is analytically inverted to produce an inverse function $g^{-1}(y)$; substituting the sub-box X into the modified equation to produce the equation $g(X'_j) = h(X)$; solving for X'_j with the j-th element of the sub-box X to produce a new sub-box X^+; wherein the

nuew sub-box X^+ contains all solutions of the equation within the sub-box X, and wherein the size of the new sub-box X^+ is less than or equal to the size of the sub-box X.

3. The following is an examiner's statement of reasons for allowance:

The prior art of records fails to disclose or render an obviousness of a method for using a computer system to solve a global inequality constrained optimization problem specified by a function and a set of inequality constrains comprising: receiving and storing the function f and set of inequality constraints in a memory; performing an interval inequality constrained global optimization process by applying term consistency to the set over a sub-box X, excluding any portion of the sub-box X that is proved to be in violation of at least one member of the set of inequality constraints; wherein the consistency terms involves: manipulating $g(x'_j)$ to produce an inverse function $g^{-1}(y)$; substituting the sub-box X into the modified equation to produce the equation $g(X'_j) = h(X)$; solving for X'_j with the j-th element of the sub-box X to produce a new sub-box X^+; wherein the nuew sub-box X^+ contains all solutions of the equation within the sub-box X as seen in independent claims 1, 11, and 21.

The closest found prior art is Eldon ("Global Optimization using Interval Analysis"). Eldon also discloses a method for using a computer system to solve a global inequality constrained optimization problem specified by a function and a set of inequality constrains comprising: receiving and storing the function f and set of inequality constraints in a memory; performing an interval inequality constrained global optimization process by applying term consistency to the set over a sub-box X, excluding

any portion of the sub-box X that is proved to be in violation of at least one member of the set of inequality constraints. However, Eldon fails to clearly express or disclose the consistency terms involves: manipulating $g(x'_j)$ to produce an inverse function $g^{-1}(y)$; substituting the sub-box X into the modified equation to produce the equation $g(X'_j) = h(X)$; solving for X'_j with the j-th element of the sub-box X to produce a new sub-box X^+; wherein the nuew sub-box X^+ contains all solutions of the equation within the sub-box X as cited in the claimed invention.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chat C. Do whose telephone number is (571) 272-3721. The examiner can normally be reached on 7:00AM to 5:00PM M-Th.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chaki Kakali can be reached on (571) 272-3719. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chat C Do
Examiner
Art Unit 2193

April 26, 2005

TODD INGBERG
PRIMARY EXAMINER